



# Can ‘poor’ cities breathe: Responses to climate change in low-income countries

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## ABSTRACT

Cities, especially in the poor countries, are competing with one another to generate higher growth. Such competition makes everything including the environment subservient to ‘technology’. As a consequence, they are faced with extreme weather events and are therefore important in the context of responding to climate change. They are increasingly being recognised as having unique climate risks and specific vulnerabilities due to higher concentration of people and activities. Adaptation seems to be indispensable though mitigation still will help avoiding future impacts. Urban authorities in poor countries encounter specific realities, such as occupancy in low-lying, often flood-prone, coastal locations that lack adequate protection in addition to possible vector-borne infections. In this backdrop, this paper analyzes specific factors likely to shape climate change responses of urban authorities in poorer countries who have to find ways to tackle impacts of climate change in tune to their specific institutional and social contexts and compulsions.

## 1. Introduction

There is almost consensus that human-induced climate change is a reality, which will lead to various (and still uncertain) effects on the natural environment and will continue in the future unless greenhouse gas emissions are reduced by a substantive proportion (e.g. [Adger, 1999](#); [Adger et al., 2003](#); [Klein et al., 2007](#); [O'Brien and Leichenko, 2000](#)). Cities have contributed to this aspect of climate change through their greenhouse gas emissions. In the process they also are specifically vulnerable to climate change impacts due to mere concentration of population and production activities ([Hallegatte et al., 2011](#)). Urban authorities everywhere, at least seemingly, are trying to develop robust responses to address these issues. In most of the policy papers and reports are featuring terms like fighting climate change vulnerability and developing resilient community. Moreover, cities in poorer countries confront additional factors that result from their location in the global South. In this backdrop, this paper analyzes specific factors likely to shape climate change responses of urban authorities in poorer countries vis-à-vis their counterparts in the developed world. The paper cites examples from cities, including Accra, Dhaka, Durban, Mombasa, and Mumbai to establish arguments. We bring forth the relation between climate change and urban centres, the types of environmental impacts on all urban areas, institutional and social factors shaping the responses of urban authorities. This also presents the contrasts that these environmental, institutional and social factors with other complex factors shaping the responses of urban authorities in poorer countries bring to us. The paper finally presents possible strategies for the optimal and probable climate change responses by urban authorities in low income countries. The paper is divided in four sections. The first section deals with the dynamic interconnectedness between urban activities and climate change. It

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is followed by the section discussing possible responses to the issue of climate change. The third section analyses institutional frameworks applied to dealing the situation arising out of climate change. The fourth section of the paper discusses optimal possibilities for the cities in less developed countries.

## 2. Cities and the climate change

Cities are important in relation to climate change. In considering the potential impacts of climate change,<sup>1</sup> we often get reminded of the Academy Award winning documentary by the then USA Vice President Mr. Al Gore (Choudhary, 2014). It is rightly argued that such a radical change in the *physical* geography of the world ought to lead to substantive changes in the *human* geography – ‘where people live and how they lead their lives’ (Stern, 2007, xvi). Chakrabarty (2009) in his article on ‘climate of history’ questioned the very idea of separation human from natural and argues all histories are only human history. Quoting Collingwood, he argues that even the so called fulfilment of natural instinct by human is nothing but conforming to the accepted social customs, conventions and morality. The most dogmatic understanding of human environment relation that takes geographical determinants as given and inert actually misses the point that the change in ‘natural’ is so slow that it usually does not become part of historiography (Chakrabarty, 2009; Weber, 1930/2001). Cities present the epitome of ‘accumulation of wealth for investment’, what Weber described in 1930s in the classic *Protestant ethics and Spirit of Capitalism*. They also are the specific vulnerable sites for the impact of the climate change. Projected impacts on human populations include impacts on population movement, human health, availability of water, agricultural productivity, infrastructure, industry, trade and commerce, utility services and livelihoods (Alam and Rabbani, 2007; Handmer et al., 1999; McMichael, 2000). Gaitani et al. (2011) indicated a possible higher temperature between 1° and 6 °C at the city of Athens compared to the surrounding rural areas, while Chapman et al., 2017: 1921, found urban areas to have a ‘large impact on local temperature, in some cases by up to 5° C in North eastern USA’. Tahir et al. (2014), while establishing correlation between extreme weather conditions and urbanization in Pakistan; noted rise of about 1.4° in case of highest temperature and a decline of about 2° in the lowest temperature. The quantum of actual contribution of urbanization process in the changing climate remain a matter of further study and research, one can not deny the clear association between change in temperature regimes and increasing urbanization across the world.

These major changes demand action at multiple levels – individual, local, regional, national and international, either independently or in synchronization with each other. Further, scholars call for *immediate* action because ‘(in)action now risks great damage to the prospects of future generations, and particularly to the poorest amongst them’ (Stern, 2007, xiv). The acceptance and articulation of relatively greater vulnerability to poorer sections of society and is not unusual. The specific threat to population in Bangladesh, or in small island developing states is well documented (Pender, 2008; World Bank, 2011). It is evident that knowing area specific and community specific impacts and determination of particular *vulnerabilities* to climate change will assist in ascertaining different institutional and individual responses. Vulnerability to climate change is referred as ‘the exposure of individuals or groups to livelihood stress as a result of the impacts of environmental change’ (Adger, 1999, 249). However, there could be other vulnerabilities as well which can go beyond livelihood stress specially the possible health hazards and physical constraints. Vulnerability is a socially differentiated, dynamic and relative construct, particularly in context of climate change, as various groups or individuals will be exposed to stress in different ways which would be largely dependent on their capabilities and entitlements (Adger, 1999; O’Brien and Leichenko, 2000). Mere geographical location also affect the entitlements specifically natural environs, which is not universally accessible, but different communities and groups have occupied certain locations which have relatively greater vulnerabilities (Choudhary, 2013; Ghosh, 2013). This is the reason, we argue, that environment and ecologies are not neutral, rather they are shaped by political processes and technological access, other than relative competence to use national and international power. Both biophysical and social vulnerability are to be taken into consideration (O’Brien and Leichenko, 2000, 224) because living in a vulnerable location does not necessarily imply that groups or individuals face similar level of limitation to cope with climate change impacts. Although ‘vulnerability to climate change...is not strictly synonymous with poverty’ (Adger et al., 2003, 182), it is rightly argued that ‘the poorest countries and populations – will suffer earliest and most, even though they have contributed least to greenhouse gas emissions’ (Stern, 2007, xvi).

As climate change discussions are increasingly moving from global to *local* studies of impacts and appropriate responses (Kovats and Akhtar, 2008), cities are being recognised as exceptionally important area shaving unique climate risks in relation to climate change (Doherty et al., 2016). This is partly due to demographic shifts: 50% of the world’s population lives in urban areas (United Nations Population Fund (UNFPA), 2008) and partly due to growth of individual to unprecedented sizes (Grimm et al., 2008, 756). Additionally, all large cities, even the most wealthy, are vulnerable to the various components of climate change, namely the increasing frequency and severity of extreme and rapid events, like storms, cyclones, heat-waves, flash floods and so on. It gets compounded by gradually changing environmental conditions and varying response and adaptive capacities in different urban situations (Parnell et al., 2007, 358–9). Cities have contributed largely to global climate change through emissions, alteration of land

<sup>1</sup> The projected rise of between 2 and 5 °C in global mean temperatures (Stern, 2007) could lead to varied effects on the natural environment including flooding, sea-level rise, drought periods, windstorms, hail, temperature extremes, changes in the patterns of pests and vector-borne diseases, salinization of freshwater supplies, ocean acidification, beach erosion, and changes in the frequency and intensity of extreme events although there is uncertainty about when and where certain impacts will occur (Carter et al., 2015; Handmer et al., 1999; Laukkonen et al., 2008; McMichael, 2000; Nicholls, 1995; Revi, 2008; Stern, 2007). The documentary ‘inconvenient truth’ brings visual impact of climate change to the common minds, which later got emboldened by the IPCC assessment, though experts questioned the estimation of IPCC (Choudhary, 2014).

cover, consumption of resources and generation of waste (Parnell et al., 2007; Wilby, 2007); yet, climate change is also likely to have ‘profound implications for cities’ (Parnell et al., 2007, 361), related to human health, livelihoods and the environment. Since it is generally agreed that little can be done now to reverse adverse effects from past emissions (see e.g., Adger et al., 2003; Awuor et al., 2008; Bartlett, 2008; Kovats and Akhtar, 2008; McGranahan et al., 2007; Stern, 2007), adaptation (responding to climate change impacts) will be necessary (Adger et al., 2003), although mitigation (controlling greenhouse gas emissions) is still needed to avoid future impacts.<sup>2</sup> Because individuals are unlikely to change behaviour autonomously to achieve an alteration of global ‘business as usual’, government “intervention is necessary to enhance the ability to adapt to new or changing conditions without becoming more vulnerable or shifting towards mal-adaptation” (Adger et al., 2003, 190). Therefore, urban authorities will be important actors in responding to climate change.

Urban authorities have particularly important roles to play because they ‘may be more effective than nation-states’ (Bulkeley and Betsill, 2003, 29) for the simple reason that their citizens have large capability to negotiate and also get larger space in print and electronic media. Their role in addressing the locally felt impacts of climate change thus become paramount (Douglas et al., 2008). Not surprisingly, ‘there are differences and similarities in the formal roles and responsibilities of local government’ (Bulkeley and Betsill, 2003, 68) among different cities and there is variation in the balance of power between local, regional, and national institutions (Parnell et al., 2007). In general, however, municipal governments can influence many issues related to mitigation and adaptation because they have authority over disaster preparedness and response, city planning and development, public health, housing construction and improvement, along with the quality and provision of infrastructure, water, sanitation, drainage, solid waste collection and transportation services (Bulkeley and Betsill, 2003; Tanner et al., 2007). Municipal governments also ‘have the technical expertise and finances required to provide social protection from natural hazards’ (Wisner, 2003, 181). Since ‘climate change generally exacerbates existing problems rather than creates fundamentally new problems,’ (Nicholls, 1995, 377) understanding past and present-day responses by urban authorities to natural hazards and changing environmental conditions can help to determine components of successful future adaptation. Thus, an important factor in determining climate change responses is the anticipated environmental impacts at the city level. Urban areas are increasingly accepted as having a distinct role in the climate agenda in terms of both mitigation and adaptation (Doherty et al., 2016).

### 3. Environmental factors

Direct environmental impacts on cities include disproportionate effects from temperature increases, changes in glacial melt and sea-level rise. The possible rise in temperature are expected to exacerbate the urban heat island (UHI) effect<sup>3</sup> (Corburn, 2009, 416), whereby cities are warmer than their surrounding areas. Consequently, increased temperatures could disproportionately affect health in cities, having the greatest effects on vulnerable populations, such as the elderly and the urban poor (Huq et al., 2003). Extreme heat could also ‘amplify the production of photochemical smog...in urban areas, thereby increasing health risks’ (McMichael, 2000, 1122). Climate change may also affect urban settlements that ‘rely on glacial melt water, which will eventually lose this source and will have to seek alternatives, such as... groundwater wells,’ (Kovats and Akhtar, 2008, 167); changing sources of water could in turn cause problems of land subsidence if underground aquifers are overdrawn (Nicholls, 1995).

An additional direct effect is the location of many cities in coastal areas; nearly two-thirds of urban settlements with populations greater than 5 million, at least partly, are located in this zone what is usually known as ‘low elevation coastal zone’<sup>4</sup> (LECZ) (McGranahan et al., 2007, 17). Further, there is an increasing trend of movement towards the coast in areas including São Paulo and cities in China (McGranahan et al., 2007; Nicholls, 1995). Once sea-level rises, these areas will have to combat flooding and beach erosion. Along with these, increased intrusion of saline water in their freshwater reserve will affect drinking water supplies. As the cities have higher population density the cost of relocation would be far more than relocating any isolated coastal settlement. Cities are vulnerable to climate change in different ways than rural areas and we ought to respond appropriately. Developing responses often requires ‘integration of technical and policy issues at multiple scales’ (Corburn, 2009, 414), hence, institutional and social dimensions of urban governance are important factors to consider.

### 4. The Response: Intergovernmental Panel on Climate Change (IPCC)

The Paris Agreement of 2015 recognizes the vital role of ‘non-party stakeholders’ such as cities in the global response to climate change. During the Climate Summit for Local Leaders held in Paris during COP-21, 440 mayors and other leaders from sub-national constituencies made ambitious pledge to significantly reduce urban greenhouse gas emissions by 2030, which is equivalent of up to

<sup>2</sup> Although international action on climate change has historically centered on mitigation, policymakers and researchers are increasingly moving to adaptation (Kovats and Akhtar, 2008). Despite some synergies between mitigation and adaptation (e.g. “[tree] planting...in urban areas help[s] sequester carbon...and reduces urban heat stress in summer” (Pizarro, 2009, 1), these all-encompassing solutions are limited. Therefore, those responding to climate change will have to consider mitigation and adaptation separately.

<sup>3</sup> The UHI effect results from the fact that “building materials retain more solar energy during the day, and have lower rates of radiant cooling... [at] night. Urban areas also have lower wind speeds, less convective heat losses and evapotranspiration, yielding more energy for surface warming” (Wilby, 2007, 33).

<sup>4</sup> The Low Elevation Coastal Zone (LECZ), is defined “as the contiguous area along the coast that is less than 10 m above sea level. Overall, this zone covers 2% of the world’s land area but contains 10% of the world’s population and 13% of the world’s urban population” (McGranahan et al., 2007, 17).

30% of the difference between current national commitments and the 2° emissions reduction pathway identified by the scientific community. Cities are already using the ‘Compact of Mayors’ as a common global platform to measure their contributions to Nationally Determined Contributions (NDCs) in terms of GHG reduction goals and climate mitigation and adaptation action plans (ISOCARP, 2018).

Continuing this trend, the first-of-its-kind IPCC Cities and Climate Change Science Conference was held at Edmonton, Canada during March 5–7, 2018. Scientists, policymakers, researchers, and development experts from across the globe participated to advance collective understanding of impact of climate change on urban spaces as well as the potential critical role that cities can play in scaling up response to climate change. One of the objectives of the conference has been to establish a global research agenda to extend support to a new special report on climate change and cities to be prepared by the IPCC known as the Appraisal Report (AR) of the seventh cycle (2023–28), i.e. AR7. The agenda has its focus on a blueprint for new scientific research, supporting effective climate action strategies, which could be deployed in cities around the world (IPCC, 2018). During the conference, the discussions were centred on how science can partner with policy and practice to transform cities to address climate change. The need for solution-oriented knowledge; strengthening the social sciences to better understand complex issues, such as the role of informal settlements in addressing climate change; and research that focuses on issues of equity, power distribution, integration of values, and human behaviour to create real transformative changes in cities.

Other key points that emerged during the discussions included the limited availability, quality and accessibility of city-level data on GHG emissions; the limited literature on climate change regarding cities in developing countries; the special challenge to assessment presented by the informal sector; and limited and fragmented understanding of policy and governance systems (IISD, 2018). In the earlier reports of IPCC the linkages between urbanization, cities and climate change were indirect, e.g. 4th Appraisal Report described how the interactions between urbanization and climate change have led to concentrations of urban populations and the interactions between climate change and a globalized economy with long supply chains, resulting in impacts spreading from directly affected areas and sectors to other areas and sectors through complex linkages. The IPCC-AR7 inter alia also brought out how impacts and vulnerabilities of climate change were influenced by local contexts. Key risks are most often related to climate phenomena that exceed thresholds for adaptation (e.g., extreme weather or abrupt changes) and limited resources or institutional capacities to reduce risk and cope. The 5th IPCC Appraisal Report provided focus on community based adaptation techniques adopted in some cities in the Global South and challenges of governance, planning and management of urban spaces for successful adaptation and mitigation as well as integrated assessment of vulnerabilities in urban space. The focus of the IPCC-AR7 seems to be moving towards a paradigm shift in acknowledging and mainstreaming the role of cities in addressing climate change. However, it is important to analyze if all cities across rich and poor countries have same capabilities to deal with varying levels of physical, ecological and social vulnerabilities. Unless, the existing variability in the conditions, contexts and society becomes cornerstone of multilateral institutional negotiations, the possibility of ‘poor cities’ to breath safe remain grim. It is in this context important to analyze the institutional, social and political factors in rich and poor countries which shape the responses to the current and future vagaries of climate change.

## 5. Shaping the responses: Institutional and Social Factors

Urban authorities in both rich and poor countries try to find ways to confront the environmental impacts of climate change in the light of their specific institutional and social contexts. Urban areas often face both the direct and the indirect impacts of climate change resulting from changes inside and outside of the city at different scales. Some of the changes are at global scale but outcomes are at local scale, e.g. the increase infiltration of ultraviolet (UV) rays. Although the population of some of the large cities in the rich countries has stabilised (Parnell et al., 2007) and there are variations across countries, most are becoming increasingly urbanised and continue growing with multiple levels of migration and immigration. With ‘the advent of industrialization, stagnation of rural economy, insecurity about the availability of food in rural areas, the search for refuge from conflict and environmental damage and the lure of jobs, amenities and stimulation’, the process of redistribution of population from rural to urban and also from urban to urban continues unabated (McMichael, 2000; World Economic Forum (WEC), 2017). Urban settlements often become centres of poverty, leading to crowding and unsanitary conditions; they thrive at the cost of large population, which live in unliveable condition in the same geographies (McMichael, 2000). Poor residents of all large cities are also ‘double exposed’ (O’Brien and Leichenko, 2000) to negative externalities of climate change and globalisation. Climate change increases the physical vulnerability of such populations to extreme weather events (e.g., Hurricane Katrina), economic vulnerability caused by globalisation (e.g., reduced demand for low-skilled workers) will simultaneously constrain their ability to cope due to their lower economic capabilities and limited negotiating capabilities (O’Brien and Leichenko, 2000). Urban populations also depend on environmental goods and services from ecosystems well beyond their boundaries, relying on imported food, raw materials, everyday water and energy needs, and disposing of waste elsewhere (O’Brien and Leichenko, 2000; Grimm et al., 2008). Therefore, impacts of climate change felt *outside* of cities may still have decisive repercussions within urban areas.

Coordination and social buy-in are major challenges for urban authorities. Addressing climate change requires coordination among numerous ‘urban authorities’, including water and sewerage maintenance institutions and companies, gas and electric agencies, telephone companies, police, health, transportation, education, housing and planning and organisations (Alam and Rabbani, 2007). In addition, urban authorities everywhere ought to inform residents of reforms and encourage participation in decisions (Douglas et al., 2008), which may be quite difficult because cities around the world are very socially diverse, containing individuals from many socio-economic, linguistic, ethnic and religious backgrounds (Wisner, 2003). More importantly individual’s access to information and their knowledge base are different so the meaning of messages ought to be differently read and understood. Urban authorities must also consider how planned adaptation at the government level will interact with individual and community

adaptation in order to be effective, because ‘these levels of decision-making are not independent’ (Wisner, 2003, 186). For example, despite regulations and planning on the part of urban authorities, individuals may not cooperate and may take adaptive measures that build on their own networks of social capital and institutional access (Adger et al., 2003; Wisner, 2003). Civil society groups may also conduct parallel or conflicting work (Wisner, 2003). Further, the presence of such groups across cities and their arena of intervention in these cities, if mapped, show a pattern that is anything but uniform. So the impact would also be different if not conflicting for a particular city. Therefore, ‘a balance is to be struck between the need to build climate resilience rapidly and the need to avoid mal-adaptation by ensuring marginalised voices and climate science agencies contribute to the process of decision-making, planning and implementation’ without community and space bias<sup>5</sup> (Tanner et al., 2007, 3; Bartlett, 2008). Ensuring careful consideration and planning around such an urgent issue as climate change is extremely difficult. Careful planning and coordination ‘might seem fairly standard elements of governance in the well-resourced North; they get limited only as aspiration or high-pitched rhetoric in many cities of the low-income countries’ (Parnell et al., 2007). The challenges faced by urban authorities in low income countries are exacerbated by additional challenges of internal differentiation in terms of infrastructure, resources as well as consumption pattern.

## 6. Shaping the responses: Urban authorities in low income countries

In addition to the foregoing challenges, urban authorities in poor countries encounter specific factors. Cities in these countries are considered to be especially vulnerable to environmental impacts. For example, it has been observed that ‘extreme weather events ... are more prone to occur in poor countries of global south’ (Laukkonen et al., 2008).<sup>6</sup> Additionally, there is a statistically significant difference between the urban population in the LECZ in low-income countries compared to richer ones (McGranahan et al., 2007) and ‘many large cities and conurbations in the global South occupy low-lying, often flood-prone, coastal locations...that lack adequate protection’ (Parnell et al., 2007, 357), in addition to poorly maintained altered natural drainage system in the city. Small island developing states,<sup>7</sup> in particular, are to be severely affected if the estimated sea-level rise becomes a reality (Bigio, 2003). Cities in poorer countries have to combat diseases that are not prevalent in the North, and as global temperatures rise and local flooding occurs, it is probable that ‘mosquito-borne infections, such as malaria, will become more prevalent in highland cities in low-latitude countries (such as Nairobi and Harare)’ (McMichael, 2000, 1120) or can very well be prevalent in cities with poor sanitation system like Gurugram in India, despite being in traditionally non-mosquito breeding zones. These added altered environmental factors, which is mostly outcome of the reshaped ecologies due to political and social factors adds complexities to the already existing challenges confronting urban authorities in poorer countries.

Urban governance is complex everywhere; urban authorities in poor countries are particularly constrained due to financial limitation and inability to attract global investors in their basic infrastructure rejuvenation plans. These entities are ‘often *over-burdened*’ with tasks related to coping with climate change impacts as these are only one part of the bouquet of services they have to deliver (Laukkonen et al., 2008, 2). Urban authorities in these areas also often lack ‘financial resources, technology, specialized institutions and human resources, access to information, and the existence of legal, social, and organizational arrangements’ (Bigio, 2003, 94). Taking cases from many part of Africa, Magadza (2000) showed how these issues get intensified if a city lacks a stable political system and governance. Socio-political elements also exacerbate poor governance. In response to the growth of slum settlements, governments are often unwilling to include these areas in urban planning or provide adequate services because these areas are considered illegal (Douglas et al., 2008; Quarantelli, 2003). In Indian cities such as Mumbai, ‘the influential middle...and upper classes have relocated to...suburbs,’ leading to neglect and ignorance of the challenges faced by the urban poor (McMichael, 2000, 1118). While inequality certainly exists in rich countries, urban authorities in those areas often have the ability to provide at least basic services for all constituents, while those in poor countries do not (Parnell et al., 2007), primarily because of existing patrimonial governance structure where citizens fail to articulate their rightful demands and remain confined in the religion, ethnicity or caste based rhetoric (Ruud and Heierstad, 2016). Thus, lack of institutional capacity and social inequality in poor countries often increases environmental vulnerability of entire cities.

Owing to lack of capacity, living conditions in urban areas in poor countries are worse off than in the rich countries. These cities often have large unplanned geographical space within their city limit apart from the sprawls. They are faced with substandard construction, inadequate water and sanitation services, crumbling transportation networks and inadequate waste management, which causes materials such as plastic bags to block drains and gutters (Douglas et al., 2008; Quarantelli, 2003). Following the international division of labour and global restructuring of economic spaces, industries, especially production units, got relocated in the poor countries, either in the existing cities or creating new cities or exclusive economic zones. Such relocation has clear objective to bypass the environmental costs to the company other than getting cheap labour and tapping new markets. Within the cities of the poor countries, these industrial zones are often located in ‘less-affluent’ areas, exposing already vulnerable populations to additional

<sup>5</sup> For example, ‘upgrading a road so that it is not washed away by flooding means considering the increased and more rapid traffic that will be generated, and the effects for children playing or walking to school’ (Bartlett, 2008, 503).

<sup>6</sup> Giambelluca and Henderson-Sellers, 1996 for information about differences in the potential impacts of climate change between the North and Southern Hemispheres.

<sup>7</sup> Small island developing states typically have only one or two urban centres located in coastal areas ((Pelling and Uitto, 2001). Among these states, the Caribbean is the most urbanised region (Ibid.). Many of these nations are located in the tropics and are especially vulnerable to extreme weather events. Due to their small size, it is possible that entire nations will be forced to move in the event of extreme sea—level rise. Therefore, it is argued that while urbanization in these nations can be advantageous because it provides a centralised means for coping with disasters, “what is needed in urban areas is appropriate planning regulation supported by systems of accountable governance” (Pelling and Uitto, 2001, 58).



hazards in multiple ways including air and water pollution (Quarantelli, 2003, 212). In the poorer countries, these become extreme due to lower level of environmental awareness among the citizens and inefficient governance structure along with patrimonial state (Ruud and Heierstad, 2016). The crowded and unsanitary conditions of slums and squatter settlements do also amplify the transmission of infectious diseases (such as cholera and malaria) (McMichael, 2000). Because undeveloped land is available only in the category of ‘wasteland’, most of the informal settlements are located in precarious areas such as low-lying flood zones near water bodies or poorly drained hillsides, which are especially vulnerable to mudslides or flooding (Masika, 2002; Nicholls, 1995; O’Brien and Leichenko, 2000; Stern, 2007; Tanner et al., 2007). Due to these challenges, ‘most poor countries and cities’ priorities are very short term in terms of dealing with the ecological crisis. The articulated priority of these states principally remains to poverty reduction and development, and usually not to the risks of long-term climate change (Divan and Rosencranz, 2001; Parnell et al., 2007).

The capacity constraints of urban authorities in poor countries also leave majority of population to develop an individual, autonomous coping strategies for climate change. For example, when residents of Alajo<sup>8</sup> were in danger, they resorted to self-help or were rescued by other members of the community with almost zero government involvement (Douglas et al., 2008, 197). In most of the low income countries, where urban authorities lack capacity, social capital remains the only important asset than in richer countries (Wisner, 2003). The fact is the even this capital, i.e. ‘social capital’ as is the case with ‘finance capital’ is distributed highly uneven especially in poor countries, where it is crucial to save the most vulnerable. Tanner et al. (2007) on the basis of their study of El Salvador show similar outcome, as it ‘indicates that slum residents are conscious of climate related risks and are active in mitigating their vulnerability to such events by diversifying their livelihoods, investing in easily sold assets, and obtaining access to remittances’, but mostly without government’s support (Tanner et al., 2007, 10). An additional form of autonomous coping is urban agriculture, which ‘is increasingly prevalent in many low income countries,’ and may provide nutritional, social and economic benefits, but may also involve ‘health hazards including the potentiation of vector-borne infectious diseases’ (McMichael, 2000, 1121). Moreover, the nature of recent development in real estate sector, and planned but outside formal structure accumulation of land for speculative capitalism is making urban agriculture difficult with each passing day (Sassen, 2015). In relatively drier regions, water scarcity adds to the woes of the people who are engaged in agriculture, as there is clear bargain between water for drinking purpose and water for irrigation and the decision naturally goes in favour of drinking purpose. These actions also conflict with the plans of urban authorities as they often are late respondents to the already constructed high-rises just beyond their municipal limits. Due to the lack of resources on the part of urban authorities, ‘local voluntary groups, assisted by national or international NGOs’ (Douglas et al., 2008, 203) often have to address issues related to disasters or extreme weather events in poorer countries when such crisis occur. Urban authorities in these areas therefore also face the challenge of integrating autonomous actions and the work of NGOs with their climate change responses.

In addition to autonomous actions, urban authorities also need to consider the fact that most of the future growth of the urban population is anticipated in the cities of low income countries (Wilby, 2007) and ‘nearly all new megacities are going to come in the countries of the global South (Grimm et al., 2008). As migration continues to be ‘expression of human aspiration for dignity, safety and better future’, it might get exacerbated by imminent changes in agriculture, because it has relative greater importance of this economic sector in poorer countries (Stern, 2007; World Economic Forum (WEC), 2017). Urban authorities have to consider the implications of such migration, including the aggravating gender composition in the cities, as is it mostly men who migrate (Reyes, 2002). Seasonal changes in population, because individuals migrate to cities periodically, as seen in Vietnam (Adger, 1999) and the potential introduction of vector-borne diseases originating in rural areas (such as schistosomiasis and Yellow fever) are also the new realities which these poorly equipped institutions have to respond to (McMichael, 2000). In addition, migration may lead to ‘local changes in the city that stem from the activities of the migrants as they build homes, compacting the ground and altering the ways in which rainfall collects and flows towards streams and rivers’ (Douglas et al., 2008, 188). Therefore, urban authorities in poor countries are in a state of pressing challenge to take steps to improve their capacity in order to select appropriate responses in the face of urbanization.

Urban authorities in poor countries also have to consider how the challenges of climate change will affect development assistance as well as their plans of poverty reduction and economic growth. Cities in developing countries are already the recipients of much development assistance and are dependent on external aid in the event of a natural disaster (Huq et al., 2003). While ‘vulnerable settlements in low-income countries clearly deserve international support in...adapting to climate change’ (McGranahan et al., 2007, 36); urban authorities should be careful that the assistance they accept considers future climate change impacts (Klein et al., 2007). Additionally, as urban authorities in poor countries continue to accept assistance and look at the rich nations for guidance on best practices (Smith and Levermore, 2008); they may encounter additional considerations in responding to climate change. For example, the greenhouse gas ‘contributions from urban populations in developing countries are rapidly increasing’ (McMichael, 2000, 1122) due mainly to lifestyle changes resulting from globalisation and economic development (O’Brien and Leichenko, 2000). China, ‘is poised to overtake the USA as the largest single emitter of carbon dioxide before 2010 (IEA, 2007; IEA, 2011),’ making current decisions ‘important determinants of new and future local and global environmental stresses’ (Campbell-Lendrum and Corvalán, 2007, 110). Therefore, as these cities continue to grow, they may have to consider *mitigation* as well as adaptation, although this topic has been controversial due to the low historical emissions of greenhouse gases in developing countries (Bigio, 2003). Yet, as the international debates on this issue continue with increasing inclusion of cities in developing countries, the challenge for the urban

<sup>8</sup> Alajo is an informal settlement in Accra, Ghana. The ‘self-help’ undertaken by these residents included sleeping on top of wardrobes or moving to other locations in the city.

authorities to integrate these ideas without neglecting the specific needs of their city remains evident. Furthermore, the shift from the global to the local implies that large ‘responsibilities [may be left] with the already overstretched urban local authorities of the South’ (Parnell et al., 2007, 358). Thus, finding ways to relieve some of the burdens felt by urban authorities in poor countries can have far-reaching implications for the success of the global response to climate change. Interestingly, the technology which comes to these poor countries also in most cases is found to be obsolete; the emission is accounted on their account as production is taking place in their territory. The territoriality of production and profit remains a matter of concern for the future city governments. They need to formulate and articulate their ecological concerns clearly so that they will have the resources as well as voice to fight the climate change.

## 7. Optimal responses for poor countries

Urban authorities in poorer countries; whilst facing similar challenges to those in cities in richer countries; are faced with additional and often more complex factors in confronting the challenges of climate change. Thus, additional attention is required to these entities in worldwide climate change discussions. Scholars have suggested that potential ways to overcome these specific challenges could result from directly addressing the underlying causes of vulnerability to climate change. Simply identifying vulnerable populations is not enough; successfully adapting to climate change requires resolving broader societal issues that lead to the systematic vulnerability of certain groups (Bigio, 2003; Handmer et al., 1999; Revi, 2008; Schipper, 2007). For example, the ‘growth of slums and shanty towns in and around cities in the developing world is an expression of the persistent and widening economic inequalities in the world’ (McMichael, 2000, 1122). It is, therefore, argued that cities ‘that find more equitable means to resolve the land problems that...push their poorest...residents to settle informally on unserviced and environmentally hazardous land...will also be in a far better position to adapt to the risks of climate change’ (McGranahan et al., 2007, 35). Co-production of knowledge where technical issues are not divorced from their social setting and a plurality of participants engage in everything from problem-setting to decision making is said to contribute to more scientifically legitimate and publicly accountable urban climate change policy-making (Carter et al., 2015; Corburn, 2009, 414). However, the challenge for the authorities of the poor countries is to participate in such co-production of knowledge that can be contextual to their realities which other than having structural inequalities also is faced with the technological backwardness. Consequently, recognising inequalities, being responsive to the needs of vulnerable populations and providing better services are seen, at least theoretically, as the best ways for urban authorities to increase their resilience to global climate change. These goals of policymaking, however, will also address many challenges related to human development.

Many argue that countries need not ‘choose between averting climate change and promoting growth and development because...tackling climate change...can be done in a way that does not cap the aspirations for growth of rich or poor countries’ (Stern, 2007, xvii). This argument is highly relevant for cities, especially in relation to recent arguments that urbanization should *not* be prevented due to its linkages with economic growth and poverty reduction (Stern, 2007; World Bank, 2008, 2010). Therefore, in order to address multiple issues simultaneously, climate change responses must be linked with ‘a long-term vision for urban development with an action plan for infrastructure upgrading, poverty reduction and better governance’ (Revi, 2008, 222). Additionally, climate change responses should also be integrated with ‘multilateral, environmental agreements...as well as with other national sustainable development plans or strategies’ (Adger et al., 2003, 191). Furthermore, solving the issues resulting from climate change in urban areas should incorporate information from several different intellectual traditions, including natural science, urban development theory and vulnerability/disaster risk-reduction studies (Doherty et al., 2016; Parnell et al., 2007). For example, the government in Bangladesh with an aim to improve air quality and reduce emissions in Dhaka introduced compressed natural gas (CNG) for transport and banning older buses and trucks (Alam and Rabbani, 2007); as was done in India in early 2000 for Delhi. In Mombasa, as part of its effort to improve general communications, the government ‘is also increasing its efforts towards creating public awareness of climate change – and associated communication and dissemination – by installing an automatic message switching system at Moi international airport’ (Awuor et al., 2008, 238). In Durban, the ‘municipal government...has developed a locally rooted climate change adaptation strategy’ (Roberts, 2008, 521) which has ‘made clear the relevance of climate change issues for virtually all departments and agencies within the municipality, including infrastructure, human health, food security and agriculture, water, tourism/business, and biodiversity and the coastal zone’ (Roberts, 2008, 529). These examples reveal that despite the impugning barriers specific to urban authorities in poorer countries, it is possible to confront the challenges of climate change in constructive ways that do not hinder economic development.

## 8. Conclusions

James Hansen's 1988 claim that ‘age of climate change’ has arrived lead the then USA Presidential candidate H. W. Bush to argue for “white house effect” to contain greenhouse effect (Shabecoff, 1988). However, after thirty years passed, the world is at worst than it was in 1988 in terms of most important criteria; fossil fuels provided about 79% of the world's energy needs which has gone up to 81%, despite every wind turbine and solar panel or even the nuclear plant (Holthaus, 2018). Climate change and consequent extreme weather events continue to be an important global issue that affects any and most parts of the earth to the extent that Ashley Dawson (2017) wrote the book ‘Extreme Cities’, with the claim that ‘world's cities are ground zero for climate change’. Climate change and impacts related to it are no more a concern; it's almost an ‘emergency’ in the words of Holthaus (2018). Research and experiences have shown that cities confront challenges that are different from rural areas; require action on the part of urban authorities worldwide. Unfortunately, our cities even in the rich countries act in isolation without having even a regional plan at a national level (Dawson, 2017). The cities of the poor countries have not yet even come to terms that people are above ideology and priority of multiple levels

of governance structure have to be people and not their loyalty to the ideology that they contested (election) with. Furthermore, urban authorities in poor countries face specific challenges in developing responses to climate change than those in richer countries. These unique factors include increased vulnerability, projected increases in greenhouse gas emissions owing to relocation of manufacturing units, limited capacity on the part of urban authorities, continuing trends of urbanization, higher prevalence of informal settlements and slums, and the pressing challenges of poverty and economic development. One possible way to address these would be incorporation of ideas of resilience and social-ecological resilience to the existing urban research, as it challenges the risk that constitutes vulnerabilities (Beilin and Wilkinson, 2015). As the populations and emissions of these cities are increasing rapidly, they compete to attract more and more industries willing ignoring the environmental consequences leading to further accelerated construction and resultant pollution. The global fight against climate change cannot succeed if we leave these cities of poor countries to deteriorate. Issuance of advisories and denial of sports or business activities on these locations for any particular time would not contribute to the mitigation strategy against climate change. Finding effective means of adaptation and mitigation in these areas is important and only alternative. Although more research is needed in this area (Tanner et al., 2007; Wilby, 2007), it is argued that climate change responses that are integrated with policy and economic development programs and that directly address the underlying causes of vulnerability have greater chance to be successful in creating resilience to climate change impacts in cities in poorer countries. The specific adaptation measures which are reported from Africa and Asia with regard to water issues can provide insights to the urban local bodies which are struggling to respond to vulnerabilities arising out of climate change (Das and Safini, 2018; Muller, 2007). The discourse on response to climate change has to incorporate relative vulnerabilities and appropriate proportionate responses rather than universal nature of defining problems and similar response strategies at every location. Identification of nature of vulnerability, specific locations and populations and their specific capabilities to confronting the challenges of climate change needs to be the part of agenda, if poor countries and poor locations in any country have to survive the expected impacts of the climate change, which ultimately will determine the global impact as poor are large in numbers.

## Declaration of Interest

None.

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